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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/050,639	01/15/2002	Whonchee Lee	150.00560104	6476

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EXAMINER
DEO, DUY VU NGUYEN

ART UNIT	PAPER NUMBER
1765	13

DATE MAILED: 05/29/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/050,639	LEE ET AL.	
	Examiner	Art Unit	
	DuyVu n Deo	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 April 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *46 and 51-88* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) *68-88* is/are allowed.

6)☒ Claim(s) *46 and 51-67* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: .

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claims 46, 51-67 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hayashi et al. (US 5,482,895) and further in review of Berti et al. (US 5,567,651).

Hayashi teaches a method of manufacturing semiconductor devices including steps: providing a substrate assembly comprising a metal nitride region and a cobalt silicide region; selectively etching the metal nitride against the cobalt silicide using a solution comprising peroxide (col. 10, line 21-62). Unlike claimed invention, Hayashi doesn't describe the solution containing a mineral acid to etch the TiN. Berti teaches a method of etching metal nitride and cobalt wherein he teaches removing the cobalt and TiN using an etchant containing a mineral acids such as phosphoric, acetic, and nitric acid and hydrogen peroxide (col. 3, line 50-55). It would have been obvious at the time of the invention for one skill in the art to modify Hayashi's method in light of Berti's teaching using an etchant containing a mineral acid and hydrogen peroxide to remove TiN because, as shown above by Hayashi, the solution of mineral acid and hydrogen peroxide would also remove cobalt. This would be more efficient, economical and saves time during removing process, and reduce contamination since one type of solution is used for removing both cobalt and TiN.

Unlike claimed invention, Hayashi doesn't describe the etch rate of the metal nitride from 50-250 angstrom/min. However, the etch rate of the metal nitride depends on the chemical concentrations, which would be result-effective variables, in the solution in which the concentration would have to be determined through test runs in order to achieve the optimum chemical concentration in the solution to etch the metal nitride with an expectation of a reasonable success. See also *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

Referring to claim 60, since cobalt and TiN are two different material, they would be removed at two different rates when etching by the same chemical, this would read on claimed selectivity etching the cobalt against the metal nitride region.

Referring to claims 52 and 62, it would have been obvious for one skill in the art to use other mineral acid that is well known to one skill in the art such as HCl to etch the cobalt and TiN with an expectation of a reasonable success.

Referring to claims 53-56, 58, 59, 64-67 above prior art doesn't disclose the solutions removing TiN and cobalt having deionized water, the chemical concentration in the solution and the etching rate of the cobalt. It would have been obvious at the time of the invention that the etching rate would depend on the chemical concentration in the solution, which would be result-effective variables, and using DI water to prepare any solution would have been obvious to any scientist during any experiment (see Wolf below); therefore, it would be within one skill in the art at the time of the invention, through routine experimentation, to dilute the solution with an appropriate amount of deionzied water in order to create a concentration of mineral acid and peroxide that would optimize the removing process of metal nitride and cobalt with an

expectation of a reasonable success. See also *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

3. Wolf et al. is cited to show prior art (page 529).

Allowable Subject Matter

4. Claims 68- 88 remain allowed.

Response to Arguments

5. Applicant's arguments with respect to claims 60-67 have been considered but are moot in view of the new ground(s) of rejection

Applicant's argument that applied prior art doesn't describe the etching rate of the cobalt and the chemical concentration in the solution is acknowledged. However, any one skilled in the art would have known that the etching rate of any material would depend on the chemical concentrations and their etch rate would have easily determined through routine experimentation, which must be done before any process can carried out. Therefore, at the time of the invention, one skilled in the art would determine the etch rate of the material and chemical concentrations including mineral acid, peroxide, and water, which would be result-effective variables and to be determined through test runs in order to provide optimum chemical concentrations for the etching with a reasonable expectation of success. See also *In re Boesch*, 617 F. 2d 272, 205 USPQ 215 (CCPA 1980).

6. Any inquiry concerning this communication or earlier communications from the examiner should be directed to DuyVu n Deo whose telephone number is 703-305-0515.

DVD
May 28, 2003